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VERIFICATION OF TRANSLATION

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I verify that the attached English translation is a true and correct translation made by me of the attached specification in the German language of International Application PCT/EP03/02033;

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Applicator head for an applicator device

The present invention concerns an applicator head for applying individual flat material elements, in particular labels, to objects, as set forth in the classifying portion of claim 1.

Applicator devices serve to apply or mount flat material elements, in particular labels, to an object. In the case of applicator devices of that nature it is important that the applicator head holds the flat material element to be applied securely during the application procedure, in particular in regard to displacement of the applicator head from a starting position in which it picks up the flat material element to be applied to the application location at which the flat material element is applied to the object. For that purpose applicator devices are known in practice, in which a suction air flow is used for holding the flat material element to the applicator head. Two different kinds of suction air applicator devices are to be found in the state of the art.

The first type of suction air applicator device includes a fan which produces a suction air flow. For that purpose the fan is disposed in the interior of the housing portion of the applicator device which also accommodates the control system and the hydraulic or pneumatic displacement means of the applicator device. The applicator head has openings therethrough in its applicator surface. The flat material element is held to the applicator head by the suction air produced by the fan.

That suction air applicator device has been found to suffer from the disadvantage that it does not operate in a fault-free manner when dealing with flat material elements which are small and/or difficult to apply. In addition that applicator device requires secondary air.

Besides the fan-type applicator device, so-called injector applicator devices are known as a further type of suction air applicator device. The injector applicator devices operate on the basis of the venturi principle. For that purpose the applicator head is again provided with a plurality of openings therethrough, wherein an injector is disposed in the interior of the housing of the applicator device, compressed air being jetted into the

injector. That causes the air to be dragged out of the applicator head so that the flat material element is held to the applicator head as a consequence of the reduced pressure produced in that way.

That injector applicator device has been found to suffer from the disadvantage that fault-free operation is only possible when all openings in the applicator head are covered by the flat material element. It follows therefrom that a suitable applicator head has to be produced for each form of a flat material element, which is disproportionately costly.

The object of the present invention is to provide an applicator head which in a simple manner permits adaptation of the applicator surface of the applicator head to flat material elements of different kinds of shape and/or size.

In regard to the applicator head the foregoing object is attained by the features of claim 1. Advantageous configurations in that respect are set forth in following claims 2 through 18.

By virtue of the possibility of being able to perforate one or both of at least two material weak locations provided on the applicator surface in order to provide one or two suction openings, the applicator surface can be readily adapted to differing shapes and/or varying sizes of the flat material elements. That applies in particular when the applicator surface has a plurality of material weak locations. They are preferably arranged regularly on the applicator surface so that applicator heads for flat material elements of different shapes and/or varying sizes can be provided by perforating desired material weak locations in the same applicator surface.

With one and the same applicator surface, it is possible to provide different applicator heads in a particularly simple manner if the material weak locations are arranged regularly, preferably in a raster grid configuration, that is to say distributed over the entire applicator surface, preferably in columns and rows.

If the applicator surface is produced from a plastic material, in particular polyethylene, static charges can occur upon detachment of the flat material element from the applicator surface. Those static charges in turn impede pushing a fresh flat material element on to the applicator

surface. In addition it is difficult when using a plastic material, in particular a PE-material, to produce the applicator surface with a material thickness which is regular throughout. In order to permit the latter and/or to avoid static charging of the applicator surface, it is further advantageous if at its outside the applicator surface is provided with grooves which preferably extend in mutually parallel relationship at an equidistant spacing. It has proven advantageous in that respect if the grooves are provided between two columns of material weak locations.

In order not to have to replace the complete applicator head each time when dealing with flat material elements to be processed of differing shape and/or size, it can further be provided that the applicator surface is provided on an applicator pad which is replaceably joined to the applicator head.

If the applicator head for applying a flat material element is displaceable in a straight line reversibly from a starting position in which it receives for example the flat material element into an applicator position in which it applies the flat material element to an object, it is advantageous if the applicator head has a pad receiving means into which the applicator pad can be reversibly inserted transversely with respect to the direction of displacement of the applicator head.

The pad receiving means can be of quite different configurations. Thus, there is the possibility that it is formed by two C-shaped guide rails which extend in parallel relationship and into which the applicator pad can be reversibly inserted.

In order to achieve a clearly defined end position when inserting the applicator pad into the pad receiving means, there can further be provided an abutment on the pad receiving means, that defines said end position.

So that the applicator pad does not come loose from its end position during the applicator process, it can further be provided that the applicator pad is releasably locked on the applicator head by a locking device. In that case the locking device can be formed by a spring-loaded ball which is provided on the applicator head or the applicator pad and which is capable

of reversibly engaging into a recess on the applicator pad or the applicator head.

A particularly simple structure can be achieved if the abutment is formed by the locking device.

The applicator pad itself can in turn be made up from quite different elements. Thus, there is the possibility that the applicator pad is formed from a carrier plate and an applicator plate including the applicator surface, the plates preferably forming at least one hollow space between them. In that case the carrier plate can be made from aluminum whereas the applicator plate is preferably made from a deformable material, in particular a plastic material, preferably PE or polyethylene.

The material weak locations can in turn be formed by different solutions and/or elements. In one embodiment the material weak locations can be afforded by recesses or depressions in the applicator plate. In that case then the remaining material, that is to say the bottom of the depression, is to be perforated by means of a suitable tool. In that case the material component portions which are displaced in the perforating operation would project outwardly beyond the applicator plate. Therefore it has proven to be advantageous if, at each material weak location at the applicator surface, preferably a depression in the applicator plate, at the other side or surface of the applicator plate which extends in parallel relationship with the applicator surface, there are provided corresponding material weak locations, preferably recesses, which are aligned with the material weak locations at the applicator surface and which are preferably separated from each other by a 'membrane', that is to say a thin material skin portion. In other words, the thin material skin portion is disposed within the applicator plate so that, in the perforation operation, component portions of the thin material skin portion do not project beyond the applicator plate.

As has already been discussed hereinbefore, static charges can occur at the applicator surface, which make it difficult to fit a fresh flat material element thereon or which make it difficult to detach a flat material element which is already disposed on the applicator surface. Grooves can be

provided in the applicator surface to prevent that from happening. Alternatively or in addition it can also be provided that the applicator plate which has the applicator surface is of a thickness, measured substantially perpendicularly to the applicator surface, which permits material removal to form a defined applicator surface which is adapted to a specific flat material element. That removal can be effected for example by a milling operation in a plane parallel to the applicator surface. That provides that the applicator surface area is reduced in relation to the area of the total applicator plate and is at least approximately precisely matched to the shape of the flat material element so that the latter does not have to be pushed over a surface region of the applicator plate or applicator surface, which region is not occupied by the flat material element by virtue of the configuration thereof, whereby the problem of static charging is further reduced.

The applicator plate and the carrier plate can be connected to each other both releasably and also non-releasably. In the case of a non-releasable connection, that can be achieved by means of an adhesive connection of the carrier plate to the applicator plate. Equally the applicator plate and the carrier plate can be connected together by a screw connection. In the latter case, care is to be taken to ensure that the join between the applicator plate and the carrier plate is at least air-tightly closed off.

In order to be able to make a communication between the applicator pad and the suction air source, the carrier plate is provided with a coupling for releasable communication with the suction air source. In that case the coupling can be formed by a preferably circular opening in the carrier plate which, when the applicator pad is mounted to the applicator head, is connected to a tube portion.

Further advantageous configurations and an embodiment by way of example of the invention are described hereinafter with reference to the accompanying drawings. In that respect it is to be noted that the terms 'left', 'right', 'down' and 'up' used in this respect relate to the drawings with the references in the normally readable position. In the drawings:

Figure 1 shows a diagrammatic perspective view of an embodiment of the applicator head according to the invention together with a tool for perforating material weak locations in an applicator surface of the head,

Figure 2 shows a side view of the applicator head illustrated in Figure 1 with the perforating tool,

Figure 3 shows a plan view of the applicator surface of the applicator head shown in Figure 1,

Figure 4 shows a view in section taken along line IV-IV in Figure 3,

Figure 5 shows the detail E in Figure 4 on an enlarged scale, and

Figure 6 shows a perspective view of a second embodiment of an applicator plate which can be received in the applicator head shown in Figure 1.

The embodiment shown in Figure 1 in the form of an exploded view for an applicator head 10 according to the invention has a mounting frame 20 for preferably releasably mounting the applicator head 10 to a housing portion of an applicator device (not further shown herein), in which is arranged a suction air source, for example in the form of an injector, and an applicator pad 40 which can be reversibly pushed on to the mounting frame 20 in a manner described in further detail hereinafter.

The mounting frame 20 is of a square basic shape and is made up of a square base plate 22 and an also square frame element 24. As can be seen in particular from Figure 4 the base plate 22 is provided with through openings 22a through which the air flow produced by the suction air source can flow from the applicator pad 40 through the mounting frame 20 to the suction air source.

At the side facing away from the frame element 24 the base plate 22 has fixing bars 22b, by means of which the mounting frame 20 formed by the base plate 22 and the frame element 24, and the applicator pad 40 which is possibly pushed on to the mounting frame 20, can preferably be releasably mounted to the applicator device (see Figures 2 and 4). The fixing bars 22b can be formed for example by disengaging and bending over through about 90° portions of the base plate 22, which necessarily

have to be removed from the surface of the plate to produce the through openings 22a.

The square area which is defined by the frame element 24 approximately corresponds to the area of the base plate 22 so that the peripheral wall 24a of the frame element 24, which wall forms the frame, delimits the base plate 22 at the edges thereof. As can be seen in particular from Figures 2 and 4, the peripheral frame wall 24a has two wall portions, a first wall portion 24aa and a second wall portion 24ab. The first wall portion 24aa which faces towards the base plate 22 defines a square area which is somewhat smaller than the base plate 22 whereas the second frame portion 24ab which adjoins same and which faces away from the base plate 22 encompasses a square area which is larger than the base plate 22. The two wall portions 24aa and 24ab are integrally connected together by way of a step.

On its side facing towards the base plate 22 the frame element 24 is provided with inwardly directed connecting bars or connecting flanges 24b, by means of which the frame element 24 is preferably non-releasably secured to the base plate 22, for example by adhesive, soldering or riveting (see Figure 4).

As can further be seen from Figure 1 the frame element 24 has in its interior a plurality of stiffening ribs 24c which serve inter alia for maintaining the stability in respect of shape of the frame element 24. In addition, at the edges, facing away from the base plate 22, of two mutually parallel wall sides, the frame element 24 has guide elements 24d which form a pad receiving means for the applicator pad 40 and into which the applicator pad 40 can be inserted. The guide elements 24d are each formed by a respective C-shaped projection 24d which extends over the full length of the corresponding frame wall and which faces into the interior of the frame element 24. If the applicator head 10 is not of a square shape but for example a rectangular shape, then the guide elements 24d preferably extend at the edges of the peripheral frame wall 24a, which form the long sides of the rectangle.

In connection with the mounting frame 20 it should also be noted that the base plate 22 and the frame element 24 can be produced from the same or different materials. It is preferable for the mounting frame to be produced throughout from aluminum or an alloy thereof.

The applicator pad 40 includes a carrier plate 42 which is preferably produced from aluminum or an alloy thereof and an applicator plate 44 which is preferably made from an easily deformable or severable material, in particular a plastic material, preferably polyethylene. The carrier plate 42 and the applicator plate 44 are preferably non-releasably connected together, for example by adhesive.

The carrier plate 42 is also of a square area extent which is congruent with that of the base plate 22. As a consequence of the width or length, which is greater than the base plate 22 and thus the carrier plate 42, of the square area enclosed by the second wall portion 24ab, the spacing of the two guide projections 24d and in particular the spacing between the base limbs of the guide projections 24d, which connect together the two free limbs of each C-shaped projection 24d, corresponds to the width and length respectively of the carrier plate 42. In addition the spacing of the two free limbs of each C-shaped projection 24d approximately corresponds to the thickness of the carrier plate 42 or is slightly larger. As a result, the carrier plate 42 of the applicator pad 40 can be inserted into the mounting frame 20 along the guide projections 24d and is securely held there.

In order to be able to move the applicator pad 40 into a position which is defined with respect to the mounting frame 20, upon inserting it into the mounting frame 20, the carrier plate 42 is provided with an abutment 42a at its edge which faces in opposite relationship to the insertion direction. The abutment 42a is formed by a bent edge portion of the carrier plate 42, which in the assembled condition faces in the direction of the mounting frame 20 and which preferably extends over the full length of that edge. When the end position is reached during the insertion movement which takes place in a direction in perpendicular relationship to the surface normal to the applicator plate 44, that is to say in parallel

relationship with the applicator plate 44, the abutment 42a bears against the wall portion 24ab of the frame wall 24a and thus delimits the insertion movement.

At its side facing towards the mounting frame 20 the carrier plate 42 has stiffening ribs 42b which promote the stability in respect of shape of the carrier plate 42. Finally the carrier plate 42 is provided with at least one through opening (not shown) through which the air flow produced by the suction air source can flow from the applicator plate 44 to the suction air source.

The applicator plate 44 is in turn of a square basic shape, the area dimensions of which however are smaller than those of the carrier plate 42 so that edges of the carrier plate 42 remain free, by means of which the carrier plate 42 can be inserted into the guide projections 24d. In addition, on its side facing towards the carrier plate 42, the applicator plate 44 has an edge flange or rim portion 44a which extends in peripheral relationship with the carrier plate 42. After the applicator plate 44 is mounted to the carrier plate 42, for example by being glued thereto, a hollow space 46 is formed by that rim portion 44a, as can be seen from Figure 4. It is to be noted in this respect that the connection between the carrier plate 42 and the applicator plate 44 is sealed and in particular is air-tight.

The side 44b of the applicator plate 44, which faces away from the carrier plate 42, forms an applicator surface to which the flat material element to be applied, such as for example a label, is held during the application procedure. That applicator surface 44b is provided with a plurality of grooves 44c which extend in mutually parallel relationship at equidistant spacing.

Material weak locations 44d are also provided in the applicator plate 44 in raster grid configuration at equidistant spacings in the spaces between two successive grooves 44c or a groove 44c and the associated edge of the applicator plate 44. Those material weak locations 44d are formed by circular depressions, as can be seen from Figure 4. At the side 44e which faces towards the carrier plate 42 and at which reinforcing ribs (not identified in greater detail) for the applicator plate 44 are disposed the

applicator plate 44 is provided in a manner corresponding to the material weak locations 44d with further material weak locations 44f which are also circular depressions. The material weak locations 44d, 44f which are oriented in mutually coaxial relationship are separated by a thin material skin portion 44g which extends in transverse relationship to their axial direction. The thin material skin portions 44g exclude a flow communication between the two material weak locations 44d, 44f which belong to each other, in particular after production of the applicator head 10 in the factory. In other words the applicator head 10 or the applicator pad 40 which can be replaceably inserted into the applicator head 10 cannot initially be used after manufacture as there is no flow communication between the applicator surface 44b and the suction air source.

Depending on the respective wish of the user of the applicator head 10 according to the invention however, one or more thin material skin portions 44g can be perforated by means of the perforating tool D shown in Figures 1, 2 and 4, as a consequence of the deformable material of the applicator plate 44, so that the material weak locations 44d, 44f form an outlet opening which is in communication with the suction air source by way of the hollow space 46 and the mounting frame 20 with the openings 22a. In that way it is possible to form operational applicator surfaces of any desired configuration, the shape and size of which depend on the shape and size of the flat material element to be applied. Figures 2 and 3 show examples of different applicator surfaces A1, A2, A3 which are all square but of different sizes. The applicator surface A3 corresponds to the full applicator surface 44b afforded by the applicator plate 44. In other words, in the case of the applicator surface A3, all thin material skin portions 44g of the material weak locations 44d, 44f have to be perforated whereas, in the case of the applicator surface A1, only about one third of the material weak locations 44d, 44f have to be perforated. It will be appreciated that it is also possible to produce other shapes, such as for example rectangles, rhombuses and so forth by means of the raster arrangement of the material weak locations 44d, 44f.

The perforating tool D can be formed by a handle portion (not identified in greater detail), at one end of which can be centrally mounted a perforating needle (also not identified in greater detail), as can be seen from Figures 2 and 4. It will be appreciated however that it is also possible to use any other tool for perforating the thin material skin portions 44g.

Figure 6 shows a second embodiment of the applicator plate 44'. This embodiment is of a predetermined material thickness which makes it possible to implement removal of material in a plane parallel to the applicator surface 44b'. In that way, as shown in Figure 6, the applicator plate 44' can be provided with an applicator surface 44b' whose size at least approximately corresponds to the size of the flat material element or label. The removal of material can be effected for example by a milling operation. In that respect the thickness of material h to be milled away can be so selected that it reaches approximately the depth of the recesses 44d' as far as the thin material skin portion 44g'. That ensures that then no secondary air issues from the material weak locations 44d' which are possibly opened in the milling operation.

The applicator head 10 according to the invention is produced by firstly providing a mounting holder 20. At the same time or subsequently the applicator pad 40 is produced, the carrier plate 42 being air-tightly joined to the applicator plate 44 for example by adhesive. All thin material skin portions 44g of the material weak locations 44d, 44f of the applicator pad 40 are still closed in that situation. Then, the applicator pad 40 is inserted into the guide projections 24d of the mounting holder 20 until a locking device (not shown) locks the applicator pad 40 to the mounting holder 20 and/or the abutment 42a bears against the outside of the frame wall 24. Then, individual thin material skin portions 44g corresponding to the shape of the flat material element to be applied can be perforated by means of the perforating tool D, at the factory at which the applicator head 10 is produced or by the customer.

Then or previously, the applicator plate 44 or 44' can be machined by means of a milling tool in such a way that a part of the applicator plate 44' projects in raised relationship, then forming the applicator surface 44b'.

In order to be able to apply different flat material elements with one and the same applicator head 10, it can further be provided that a plurality of applicator pads 40 belong to an applicator head 10. By virtue of the interchangeability of the applicator pad 40 with respect to the mounting holder 20 it is then possible for applicator pads 40 involving applicator surfaces which are perforated in different ways, for example the applicator surfaces A1, A2 and A3, to be selectively mounted to the applicator head 10.